[GFK006] Artificial Intelligence: Evolutionary Computation

GENERAL INFORMATION

Studies	DEGREE IN ENGINEERING PHYSICS APPLIED TO INDUSTRY			**Subject**	Key Technologies
Semester	1	**Course**	4	**Mention / Field of specialisation**	???
Character	COMPULSORY				
Plan	2022	**Modality**	Face-to-face	**Language**	ENGLISH
Credits	3	**Hours/week**	0	**Total hours**	32 class hours + 43 non-class hours = **75 total hours**

2030 AGENDA GOALS

PROFESSORS

CERNUDA GARCIA, CARLOS

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
Artificial Intelligence: Machine Learning	*(No previous knowledge required)*

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GFR302 - Understand and define the fundamental concepts of optimisation, both single- and multi-objective, and the elements to be considered in each problem, being able to model solution strategies based on evolutionary computation, execute them appropriately, and critically validate the solutions obtained	*x*	*x*		3
			Total:	3

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RGF403 **[!]** ***Conoce los conceptos fundamentales de la computación evolutiva y determina la estrategia adecuada para modelizar los problemas, eligiendo la estrategia idónea para su resolución e implementándola***

LEARNING ACTIVITIES	CH	NCH	TH
Computer simulation exercises, individually and/or in teams	8,5 h.	10 h.	18,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	10 h.	9 h.	19 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	30%
Individual written and/or oral tests or individual coding/programming tests	70%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 18,5 h.
NCH - Non-class hours: 19 h.
TH - Total hours: 37,5 h.

RGF404 **[!]** ***Conoce y define los conceptos fundamentales de la optimización, tanto mono- como multi-objetivo y los elementos a considerar en cada problemática, ejecutándolos y validando críticamente las soluciones obtenidas***

LEARNING ACTIVITIES	CH	NCH	TH
Computer simulation exercises, individually and/or in teams	5,5 h.	13 h.	18,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	8 h.	11 h.	19 h.

EVALUATION SYSTEM	W

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	30%	*(No mechanisms)*
Individual written and/or oral tests or individual coding/programming tests	70%	

CH - Class hours: 13,5 h.
NCH - Non-class hours: 24 h.
TH - Total hours: 37,5 h.

CONTENTS

1. Introduction to Evolutionary Computation
    1. Motivation
    2. Problem Definition
    3. Examples of Use Cases
2. Single-Objective Optimization
    1. Classic Problems: Knapsack Problem, Traveling Salesman Problem, ...
    2. Genetic Algorithms and Machine Learning
    3. PyGAD Package
3. Multi-Objective Optimization
    1. Intuition: Single vs. Multi. Similarities and Differences.
    2. Pareto Dominance Concept
    3. Classic Algorithms:
        1. NSGA-II
        2. SPEA2
        3. MOEA/D-DE
        4. NSGA-III
    4. Performance Measures

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
(No resources)	https://labur.eus/nLF2y